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[MTD 7: Light Metals and their Alloys]

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SPECIFICATION FOR ALUMINIUM TUBES FOR REFRIGERATION PURPOSES

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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January 1981

AMENDMENT NO. 1 MAY 1983

TO

IS:9612-1980 SPECIFICATION FOR ALUMINIUM TUBES FOR REFRIGERATION PURPOSES

Corrigendum

(*Page 6, Table 2, second column, first entry*) - Substitute '$\begin{matrix}+0.20\\-0.15\end{matrix}$' *for* '$\begin{matrix}+0.02\\-0.15\end{matrix}$'

(SMDC 10)

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Indian Standard

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Indian Standard

SPECIFICATION FOR ALUMINIUM TUBES FOR REFRIGERATION PURPOSES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 September 1980, after the draft finalized by the Light Metals and Their Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Aluminium tubes are being increasingly used in the country for evaporators and condenser assemblies in the refrigeration industry. It was, therefore, felt necessary to lay down the requirements for this material.

0.3 While preparing this standard, the views of producers and consumers were taken into account and the standard has been related to the manufacturing and trade practices followed in the country in this field.

0.4 Materials specified in this standard, have been designated in accordance with IS : 6051-1970*.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified vaule in this standard.

1. SCOPE

1.1 This standard covers the requirements of aluminium tubes for refrigeration purposes, suitable for a maximum working pressure of 1·7 kPa (170 N/cm^2).

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 5047 (Part I)-1979‡ shall apply.

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*Code for designation of aluminium and its alloys.

†Rules for rounding off numerical values (*revised*).

‡Glossary of terms relating to aluminium and aluminium alloys : Part I Unwrought and wrought metals (*first revision*).

3. SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of material shall conform to IS : 1387-1967[*].

3.2 The tube shall be of either 19 000 or 19 500 aluminium as specified by the purchaser (*see* 6.1). Unless otherwise specified, the tube shall be supplied in 'M' temper.

3.3 The tube shall be supplied in coils or straight lengths according to customers' requirement. All the coils, shall be sealed at both ends by crimping or flattening ends on themselves in such a manner as to produce an effective seal to prevent entrance of dirt and moisture into the tubing.

4. WORKMANSHIP AND FINISH

4.1 The tube shall be of uniform quality and temper, clean, sound and free from imperfections.

4.2 Die stop mark appearing on the surfaces of the extruded tube shall not constitute a cause for rejection.

4.3 The internal and external surfaces shall be clean, smooth and free from seams, cracks and other injurious defects.

5. SELECTION OF TEST SAMPLE FOR TENSILE AND FLATTENING TESTS

5.1 Batch — The tube of the same composition and dimension produced in the same way shall be grouped in batches of 500 kg.

5.2 One test piece each shall be taken from a tube selected at random to represent each batch or part thereof for tensile and flattening tests. Before test samples are cut off, they shall be marked to identify them with the batch they represent.

5.3 The test piece shall be taken from the tube as supplied and shall not be subjected to any thermal or mechanical working except in the preparation of test piece before testing.

6. REQUIREMENT FOR THE MATERIAL

6.1 Chemical Composition — Chemical composition of the material, when analyzed in accordance with IS : 504-1963[†] or any other suitable instrumental method, shall comply with the requirements given below:

---

[*] General requirements for the supply of metallurgical materials (*first revision*).

[†] Methods of chemical analyses of aluminium and its alloys (*revised*).

Composition	*19 000* percent	*19 500* percent
Aluminium, *Min*	99·0	99·5
Copper, *Max*	0·1	0·05
Magnesium, *Max*	0·2	—
Silicon, *Max*	0·5	0·3
Iron, *Max*	0·7	0·4
Manganese, *Max*	0·1	0·05
Zinc, *Max*	0·1	0·1
Total of all impurities, *Max*	1·0	0·5

6.2 Tensile Properties — The test piece (*see* **5**), when tested in accordance with IS : 2657-1964[*] shall satisfy the following requirements.

Material	*Condition*	*Tensile Strength* MPa *Min*	*Elongation in 50 mm Gauge Length, percent, Min*
19000	M	65	18
19500	M	65	23

6.3 Flattening Test — A test piece not less than 50 mm long, cut from the selected tube, shall be subjected to flattening test in accordance with IS : 4177-1967[†]. The test piece shall not crack during flattening until the internal surfaces of the tube meet under load.

6.4 Pressure Test Requirement — A test piece not less than ten times the nominal outside diameter of the tube shall be subjected to a hydrostatic pressure test and it should be capable of withstanding a pressure of 3·4 kPa for at least one minute without leakage.

7. DIMENSIONS AND TOLERANCES

7.1 The dimensions and tolerances of refrigeration tubings shall be as given in Tables 1 and 2.

TABLE 1 WALL THICKNESS TOLERANCES

All dimensions in millimetres.

SPECIFIED WALL THICKNESS	ALLOWABLE DEVIATION OF MEAN WALL THICKNESS FROM SPECIFIED WALL THICKNESS
From 1·00 up to and including 1·30	± 0·15
Over 1·30 up to and including 3·00	± 0·20

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[*] Method for tensile testing of aluminium and aluminium alloy tubes.

[†] Method of flattening test of aluminium and aluminium alloy tubes.

TABLE 2 OUTSIDE DIAMETER TOLERANCE

All dimensions in millimetres.

SPECIFIED DIAMETER	TOLERANCES ON MEAN DIAMETERS
Over 6 up to and including 14	+ 0·02 – 0·15
Over 14 up to and including 25	+ 0·25 – 0·15
Over 25 up to and including 50	+ 0·30 – 0·20

8. RETEST

8.1 Should any one of the test pieces first selected fail to pass the mechanical tests, two further samples from the same batch shall be selected for testing, one of which shall be from the tube from which the original test sample was taken unless that tube has been withdrawn by the supplier.

8.2 Should the test piece from either of these additional samples fail, the batch represented by the test sample shall be deemed not to comply with this specification.

9. MARKING

9.1 Each lot of tube shall be suitably marked for identification with the name of the manufacturer, and designation and temper of the alloy. If required, the supplier shall furnish a certificate that the material supplied complies with the requirement of this specification.

9.2 The material may also be marked with the ISI Certification Mark. The suppliers' certification (*see* **9.1**) shall be implied, if the material is certified under the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI Marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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